

The Office Action

Claims 1, 5, 7, 8, and 10-17 stand rejected under 35 U.S.C. § 102 as being anticipated by Anand (US 6,639,211).

Claims 6 and 9 stand rejected under 35 U.S.C. § 103 as being unpatentable over Anand in view of Riederer (US 5,122,747).

Newly submitted dependent claims 26-28 have not yet been considered by the Examiner. Rather, the Examiner has asserted that constructive election justifies the non-consideration of these claims.

Claims 18-25 stand withdrawn as being directed to a non-elected invention.

The Examiner's Holding of Constructive Election is Improper

Constructive election under M.P.E.P. 821.03 is not applicable in the present situation. First, constructive election is only applicable where there has been a previous Office Action on the merits. No previous Office Action on the merits had been rendered prior to the holding of constructive election.

Second, and more importantly, constructive election is only applicable if the added claims are directed “to an invention other than previously claimed”. That is, the same standards apply as for other Restriction Requirements.

More specifically, for constructive election to be applicable, the claims must be subjected to restriction under M.P.E.P. 806.05. In this situation, 806.05(e) is perhaps most applicable. The process and apparatus can be restricted, but only if it is shown that the process as claimed can be practiced by a materially different apparatus or the apparatus as claimed can be used to practice another materially different process.

First, the Examiner has failed to show that the apparatus of claim 26, 27, or 28 can be used to practice a materially different method or, conversely, that the method of claims 1-17 can be practiced with a materially different apparatus. Until the Examiner makes such a showing, restriction is improper.

Second, it is submitted that such a showing cannot be made. By virtue of their dependency, claims 26, 27, and 28 are required to perform every step of method claim 1. Moreover, each of claims 26, 27, and 28 is not provided with

structure which would enable it to perform a method different from the method of claim 1.

Because these requirements for restriction have not been shown and, it is submitted, cannot be shown, it is submitted that the restriction of claims 26-28 is not proper nor is the holding that claims 26, 27, and 28 have been restricted by constructive election.

An early withdrawal of the Restriction Requirement is requested.

Claim Objection

The Examiner objects to claims 26-28 indicating that they refer to apparatuses which are dependent from a method claim. No basis for the objection is provided.

It is submitted that such objection is improper. Claims of the nature set forth in claims 26-28 are regularly allowed by the U.S. Patent Office.

Second, the Examiner has failed to state a ground for such objections.

In the spirit of compromise, the applicants are amenable to placing claims 26-28 in independent form, once (1) the constructive election has been withdrawn and (2) the patentability of claim 1 has been agreed upon.

The References of Record

Anand is directed to an angiographic technique, upon which the present claims can be considered a patentable improvement. With reference to Figure 3 of Anand, Anand collects a three-dimensional k space data set in which the third direction (into the paper) is the read out or frequency encode direction. Each read out echo produces a full data line in the read out or frequency encode direction.

Anand uses a two echo sequence, although a four echo sequence is also suggested. When the first echo is read out, it produces a data line in region 300 and when the second echo of the sequence is read out, it produces a data line in region 310. Anand does not specify the order in which the data lines are read out. However, it should be noted that a row by row read out pattern would be inefficient and thus inapplicable. Consider a read out line in the vertical direction through the zero point. In this line, the number of first echoes needed to traverse register 300 would be a

mismatch with a number of second echoes needed for region 310. Moreover, in the portions of region 310 to the left and right of region 300, no first echo data would be generated and no data would be collected if a row by row read out pattern were utilized. It is submitted that Anand would size regions 300 and 310 such that the number of first echo data lines and the number of second echo data lines are substantially the same, i.e. the Fig. 3 is not to scale.

Once Anand detects a bolus in the region of interest, the data in region 300 is retained and the data in region 310 is discarded. In subsequent sampling, gradients are applied such that the data lines read out from the first echo are in region 310 and data lines from the second echo are in region 420. Again, Anand does not specify his sampling pattern. Again, it is submitted that a row by row sampling pattern would not be used because some rows would have first echoes read out and no second echoes and other rows would have second echoes read out and no first echoes.

Finally, in the outermost ring 430, Anand does not sample data lines at all. Rather, the outermost ring is zero filled.

It is only at the end of this data collection and zero filling process that Anand calls for image reconstruction to commence.

Riederer samples the data starting at the center of k space and working outward in a spiral pattern. Again, Riederer cannot start a data reconstruction until all of the data is collected.

The Present Application

Once the present application has finished the acquisition of data in the inner rings, data acquisition in the outer ring is commenced in a row by row fashion, note Figure 5. More specifically, as soon as the four data lines in row 1 of Figure 5 have been collected, a complete slice of data is available for reconstruction. As shown in Figure 6, at step 130, image reconstruction of slice 1 is commenced and as shown in step 36, the image of slice 1 is displayed. As clearly illustrated in Figure 6, the image of slice 1 is displayed while data acquisition is still being carried out. In the timescale illustrated in Figure 6, slice image 1 is displayed about halfway through the data acquisition process. In this manner, the present application generates images for the diagnostician much faster than either Anand or Riederer.

The Claims are Not Anticipated by Anand

Claim 1 calls for acquiring k space samples and at least the outermost surrounding region using a row by row data acquisition ordering in which each row of k space samples acquired in the outermost surrounding region, together with selected already acquired k space data from the regions other than the outermost region, forms a complete data set for reconstruction into an image plane. Anand does not call for the data in the outermost region 430 to be collected using a row by row data acquisition ordering. To the contrary, Anand zero fills region 430.

As an aside, even if the Examiner should seek to interpret ring 420 as the outermost region of k space, Anand again fails to disclose acquiring the data in region 420 using a row by row acquisition ordering. With the two echo technique used by Anand in which the second echo generates data lines in which the first echo generates data lines for region 310 and the second echo generates data lines for region 420, it is submitted that one would attempt to use all echoes which would require reading out the first echo from one row while reading out the second echo from a different row.

Moreover, claim 1 calls for reconstructing each completed data set into a reconstructed image plane without waiting for all k space samples in the outermost surrounding region to be acquired such that the reconstructing occurs at least partially concurrently with the acquiring. Anand fails to disclose commencing reconstruction while data in the outermost region 420 is still being acquired. Indeed, because Anand zero fills the outermost region 430, data for the outermost region is not acquired. Moreover, Anand does not suggest commencing image for reconstruction while data in regions 310 and 420 are being acquired.

Because Anand fails to disclose at least the above two discussed limitations of claim 1, it is submitted that claim 1 is not anticipated by Anand.

Dependent claims 2-5, 7, 8, and 10-17 add yet more distinguishing limitations which are not found in Anand. Accordingly, for the reasons set forth in

conjunction with claim 1, and others, it is submitted that claims 2-5, 7, 8, and 10-17 are not anticipated by Anand.

Claims 6 and 9 are Not Obvious Over Anand in View of Riederer

Riederer, which collects data in a spiral pattern, does not cure the above noted shortcomings of Anand. Accordingly, it is submitted that dependent claims 6 and 9 are not obvious over Anand in view of Riederer.

Request for Clarification

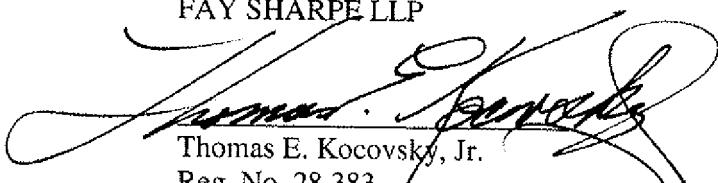
The Examiner has rejected claim 6 as being obvious over Anand in view of Riederer. Yet, the Examiner has rejected dependent claim 7, which depends from claim 6, as being anticipated by Anand. Because claim 7 includes all of the limitations of claim 6 by virtue of its dependency therefrom, it is not understood how a parent claim can be rejected under 35 U.S.C. § 103 while its dependent claim is rejected under 35 U.S.C. § 102. Clarification of the Examiner's position is requested.

CONCLUSION

For the reasons set forth above, it is submitted that claims 1-17 and 26-28 are not anticipated by and distinguish patentably over the references of record. An early allowance of all claims is requested.

Respectfully submitted,

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